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(21) Application No 8810788

(22) Date of filing 6 May 1988

(30) Priority data:

(31) 62/113846 (32) 11 May 1987 (33) JP
62/113848
62/113849

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(51) INT CL^A

H03M 11/00

(52) Domestic classification (Edition J):

G4H 14B KN

U1S 1658 1916 G4H

(56) Documents cited

None

(58) Field of search

G4H

H4T

Selected US specifications from IPC sub-classes

H03K H03M G06F

(54) Input display apparatus

(57) In a display apparatus comprising a display member adapted to display a plurality of set items and a transparent superposed touch panel formed with a plurality of touch key elements, there are provided at least one increment key 3 and at least one decrement key 4 located near a plurality of juxtaposed input data display members 2. Different decimal orders of the number displayed on the members 2 can be changed by respective increment and decrement keys 3, 4 (Fig. 1), or using common such keys with further decimal-order selecting keys. Any of the displayed set items may be changed using the same set of such keys (Fig. 1) or a separate set may be provided for each item.

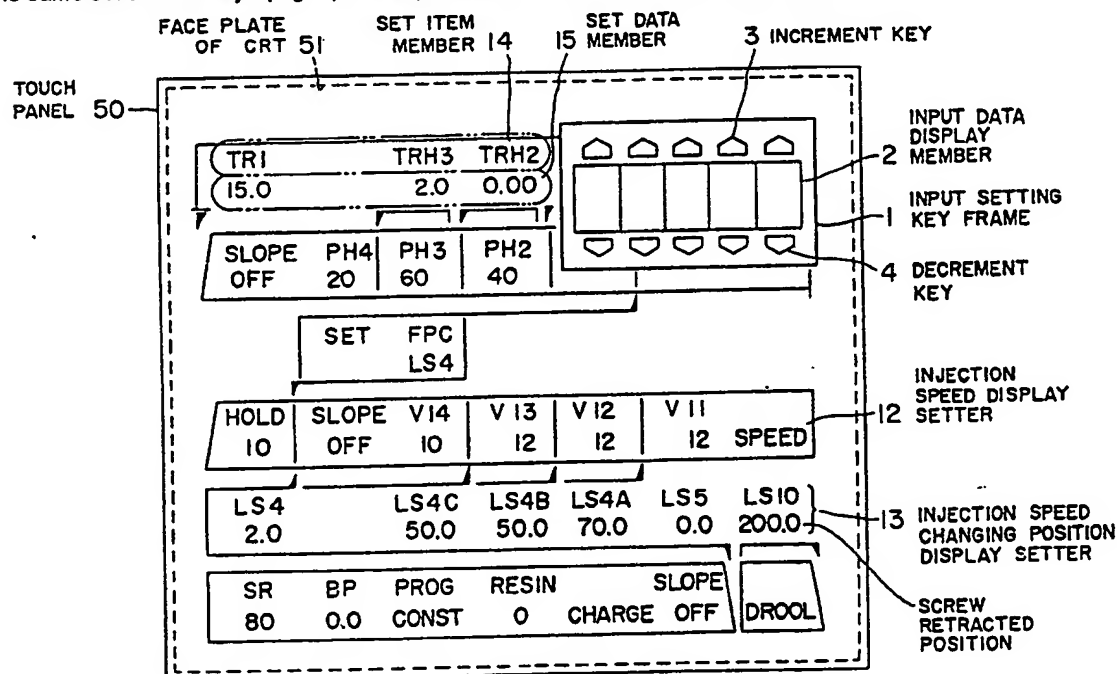


FIG. 1.

The drawing(s) originally filed was(were) informal and the print here reproduced is taken from a later filed formal copy.

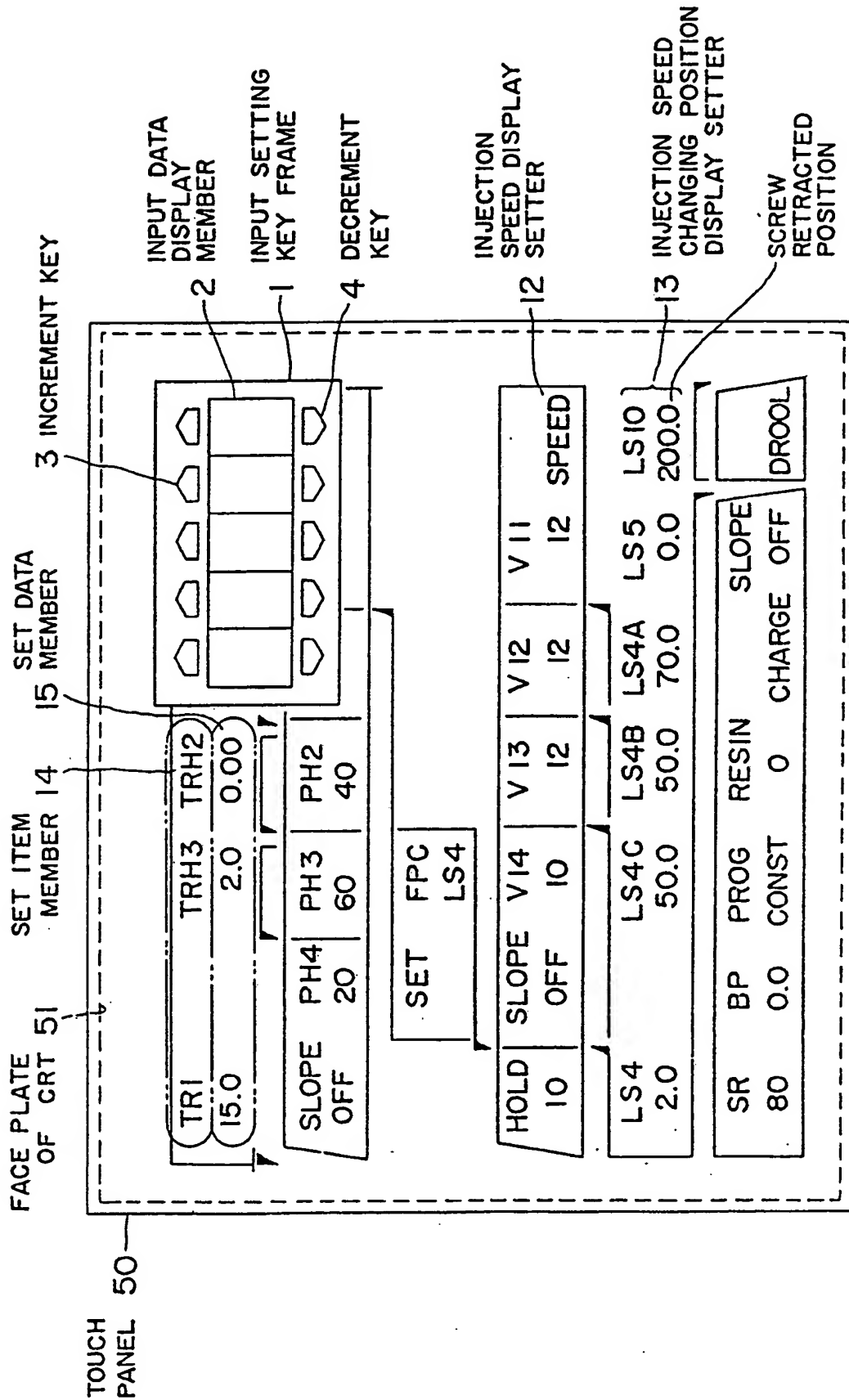


FIG. 1

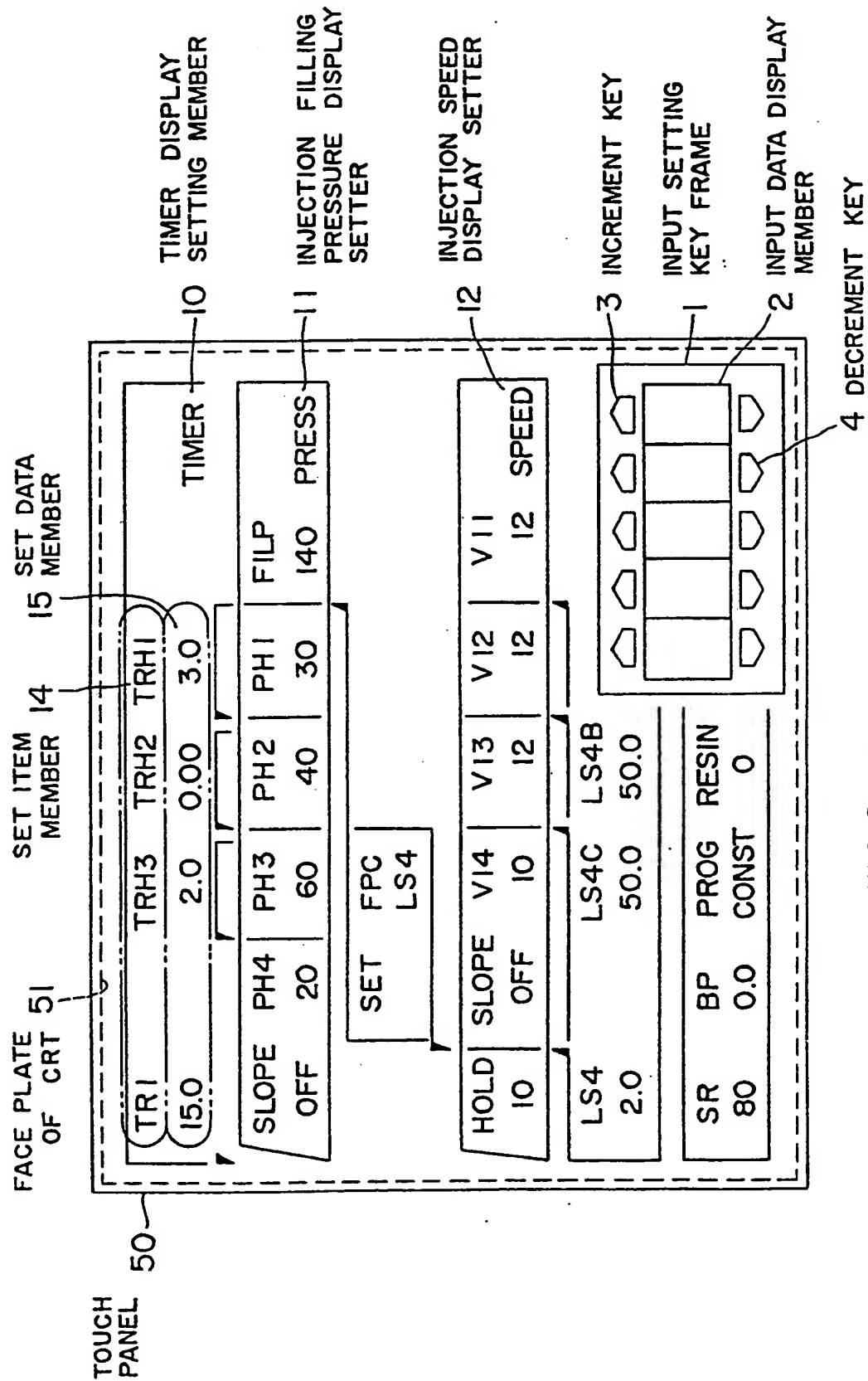


FIG. 2

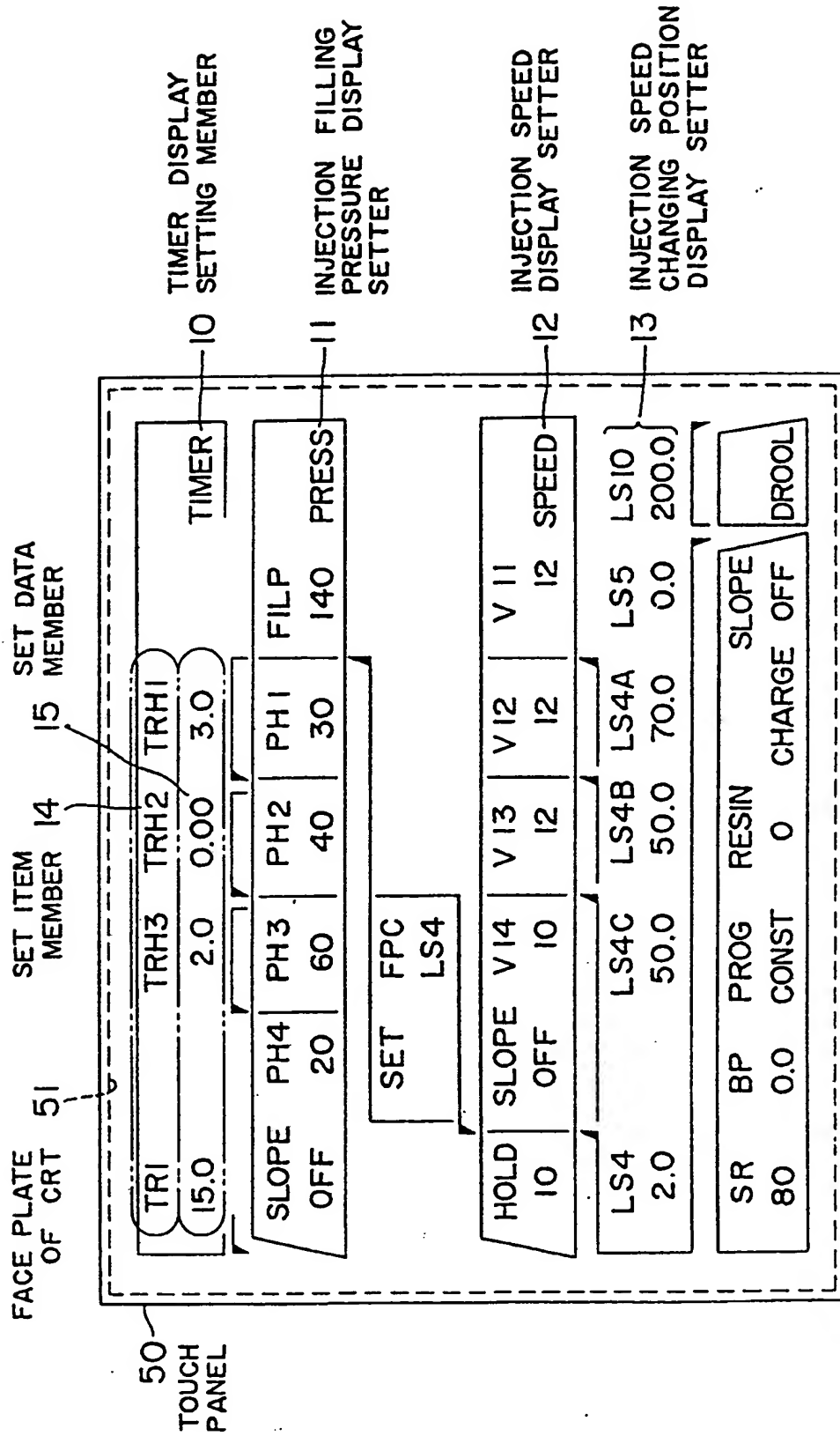


FIG. 3 PRIOR ART

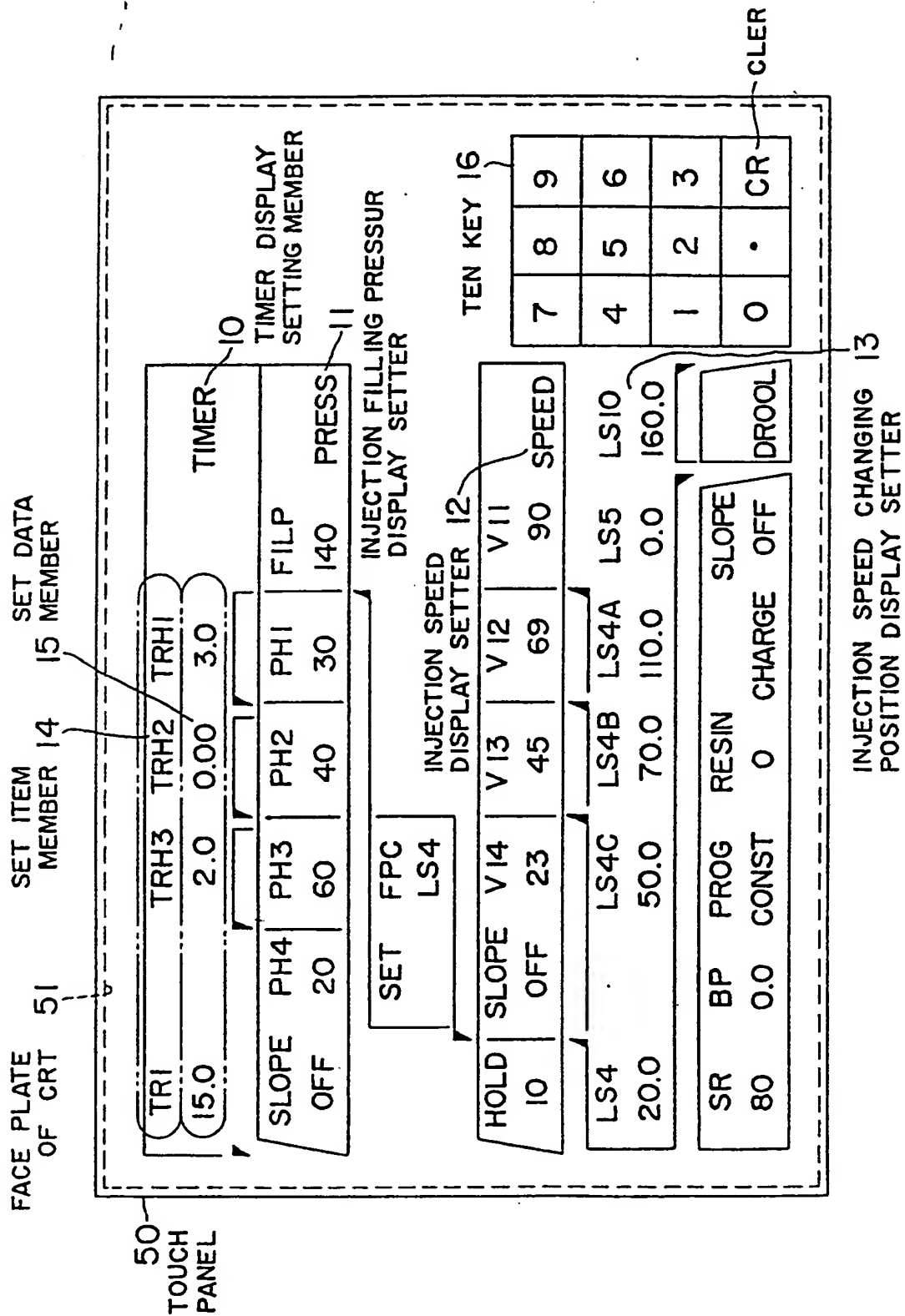


FIG. 4 PRIOR ART

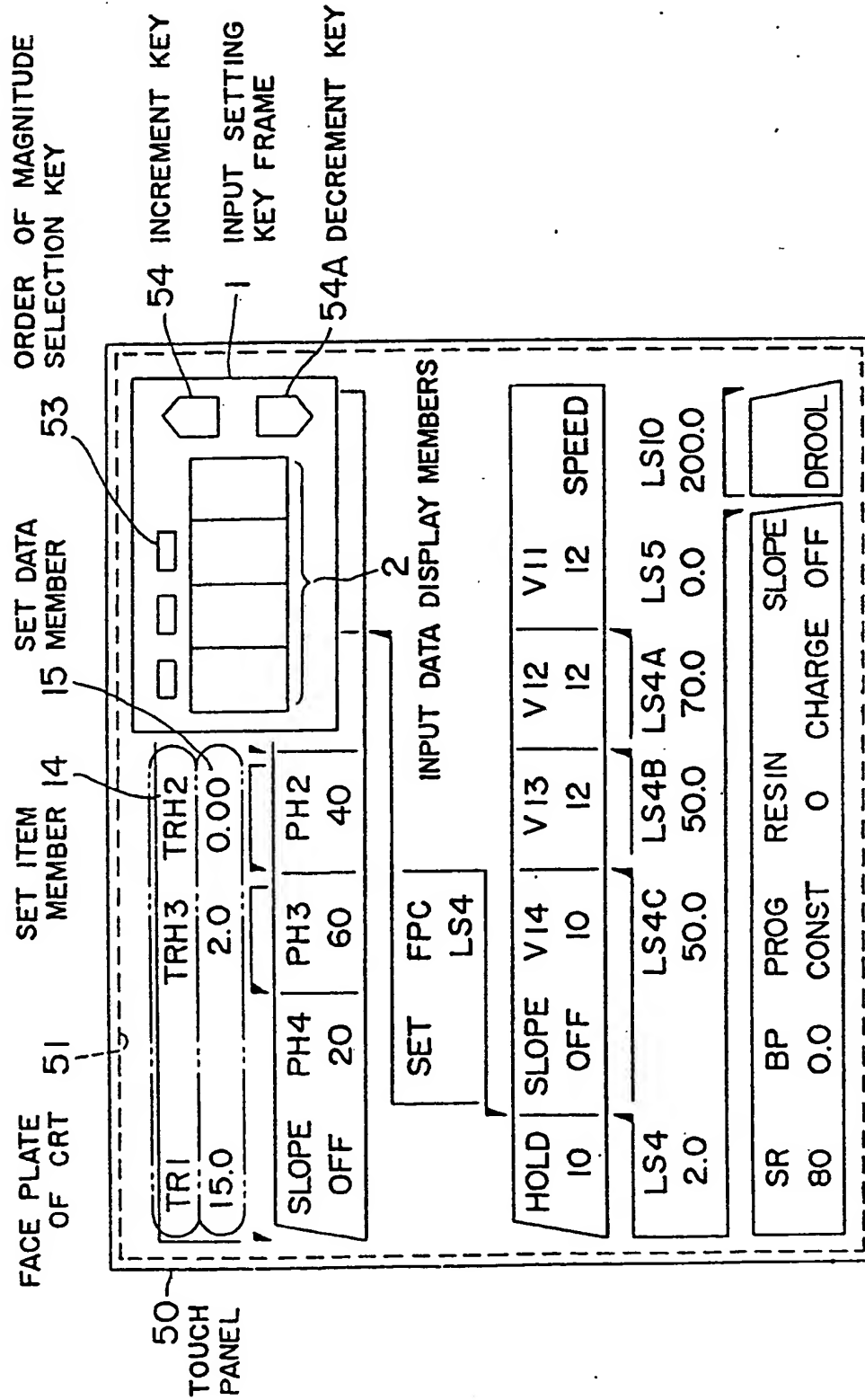


FIG. 5

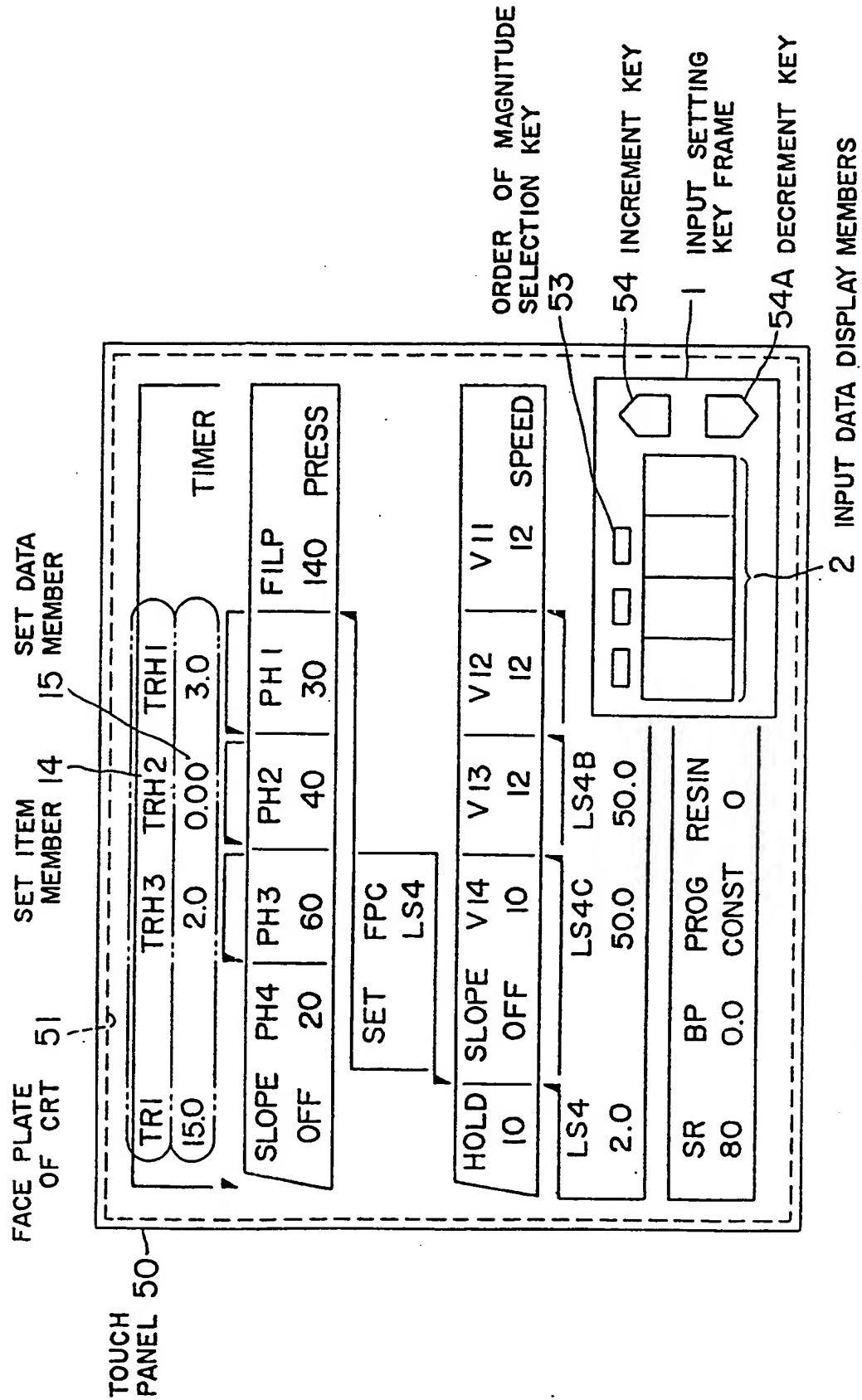


FIG. 6

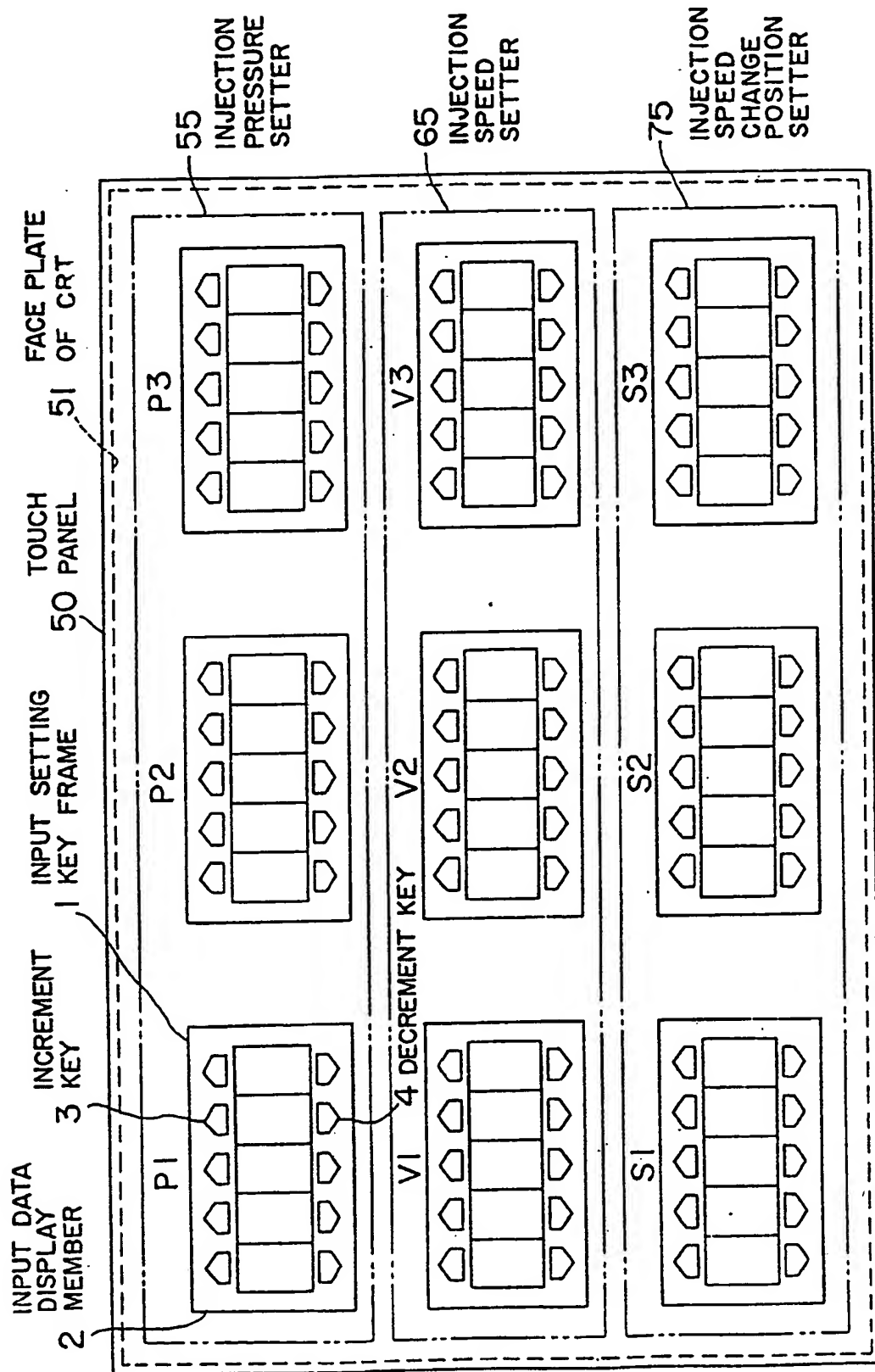


FIG. 7

INPUT DISPLAY APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an input display apparatus
5 comprising a display member of such display apparatus as
a cathode ray tube (CRT) or the like, and a transparent
touch panel superposed on the display member and provided
with touch key elements.

Although the input display apparatus of this
10 invention can be used for other applications, since it is
most suitable for an injection molding machine for
molding products having a relatively large thickness and
required to have a precise configuration and a small
internal strain, such as optical lenses, the invention
15 will be described as applied to such an injection molding
machine.

A copending US patent application Serial No.140145,
filed on Dec. 29, 1987 discloses a method and apparatus
for injection compression molding of the type described
20 above.

The apparatus for operating an injection compression
molding machine described in the US patent application
comprises a stationary metal mold, a movable metal mold,
an oil pressure actuator for advancing the movable metal
25 mold toward the stationary metal mold to form a mold
cavity therebetween with a predetermined compression
clearance δ between the movable and stationary metal

molds, a heating cylinder engaging the stationary metal mold, means for supplying a thermoplastic resin into the heating cylinder, a screw contained in the heating cylinder for injecting molten resin into the mold cavity, means for rotating the screws, means for reciprocating the screw in the heating cylinder, a screw position detector for detecting an axial position of the screw, a plurality of screw position setters respectively setting predetermined screw positions along which the screw is moved, a plurality of comparators respectively comparing output signals of the screw position setters with the output signal of the screw position detector, a plurality of mold clamping force setters connected to receive output signals of respective comparators, a transfer switch for selecting one of the output signals of the mold clamping force setters, and an electromagnetic transfer valve energized by an output signal of the transfer switch through a control device for actuating the oil pressure actuator. There is also provided a timer for setting the rotation time of the screw, that is the filling time of the molten resin.

The injection compression molding machine described above operates as follows. When the filling step is completed, the screw reaches the forward limit position. Then the metal molds are opened by moving the movable metal mold to take out the molded product. After that, metal molds are partially closed while leaving a

predetermined compression clearance δ therebetween. For preparing the next filling step, the molten resin is stored in the heating cylinder in front of the screw by rotating the same. Then the screw is retracted by the
5 cylinder while being rotated by the oil pressure motor. When the screw position detector detects a predetermined screw position, a signal is issued so that the electromagnetic transfer valve is moved to a position to block the pressurized oil discharged from the injection
10 cylinder. Consequently, the screw continues to rotate at that predetermined position, whereby the molten resin is accumulated in the space in front of the screw for an interval set by the timer. After elapse of a time set by the timer, the electromagnetic transfer valve is brought
15 to a position for advancing the screw by the injection cylinder so as to inject the molten resin accumulated in the space in front of the screw into the mold cavity under a high pressure. As the screw reaches a predetermined position, for example a position set by the
20 screw position setter, and during the injection stroke, the mold clamping cylinder is actuated to clamp together the stationary and movable metal molds so as to decrease the clearance δ . Consequently, the problem of insufficient quantity of the injected resin at each shot
25 and the problem of creating internal stress can be solved.

In an injection molding apparatus, especially in an injection compression molding apparatus it is advantageous to provide a transparent touch panel provided with a plurality of touch key elements and superposed on such a display member as a cathode ray tube. A prior art input display device utilizing touch keys shown in Figs. 3 and 4 comprises a touch panel 50 including a timer display setting member 10, an injection filling pressure display setter 11, an injection speed display setter 12, an injection speed changing position display setter 13, and other items. The touch panel 50 is superposed on the face plate 51 of a CRT. The timer display setting member 10 includes a plurality of pressure holding timers TR1, TRH3, TRH2 and TRH1 which are setting items 14 bounded by dot and dash lines, and a plurality of data display digits (in this case 15.0 sec., 2.0 sec., 0.00 sec. and 3.0 sec. respectively representing the times of timers TR1 TRH1). In a block beneath blocks 14 and 15 are depicted a SLOPE of a holding pressure, pressures held PH4, PH3, PH2, PH1 and final pressure FILP and their values in percentages 20, 60 and 40 of their maximum values. The final pressure FILP is set as 140% because such high pressure is necessary to fill the resin into an intricate mold cavity. Arrows between the blocks show relations among timer times and corresponding pressures to be held. In the row of the injection speed display setters 12 are

included pressure HOLD, SLOPE, positions V14, V13, V12, V11 representing the positions at which the injection speed is changed and speeds in % of the maximum speed at respective positions. In the row beneath the row of the injection speed display setters 12 are shown screw position detection limit switches LS4, LS4C, LS4B, LS4A, LS5, LL10, and strokes 2.0 - 0.0 and 200.0 each in mm in which 200.0 shows the retracted position of the screw. In the last row are depicted the numbers of screw revolutions SR, screw back pressure BP, metering control condition program PROG, RESIN (raw material code), SLOPE, their values 80, etc., quantity of charge CHARGE, OFF and DROOL which occurs when the nozzle is slightly separated away from the stationary metal mold. It should be understood that most of these characters except numerical digits designate touch key elements including touch keys, push buttons, etc., and that when these touch keys are operated, items to be set are selected and the numerical data regarding selected items are inputted or changed by a ten key 16 shown in Fig. 4 in which the ten key 16 is contained in the touch panel 50, that is in the area of face plate 51 of the CRT. In this manner, by selectively operating the desired touch keys, the result of the operation can be observed at a glance on the face plate.

Where a ten key on the outside of a CTR is used for effecting setting and changing of the injection speed, pressure, etc., the set data display member 15 and the

data input member are separated whereby the operativity would be decreased, whereas where the ten key is included in a portion of the transparent touch panel as shown in Fig. 4, only the area of the face plate excluding the ten
5 key can be used as the data display area or portion. As a consequence, where it is desired to display all related data on the same face plate the number of displayed data would be limited.

Where a ten key is used to input the data, even when
10 it is desired to change a little the set data, it is necessary to input all data. For example, when it is desired to change a setting of 201.5 to 211.5, where setters of the digital switch type are used, it is sufficient to change the value of tenth order of
15 magnitude to "1" from "0". But in an input system utilizing a ten key, the values of the all orders of magnitude must be renewed or reinputted which is not only troublesome but also requires a long changing time.

SUMMARY OF THE INVENTION

20 Accordingly, it is an object of this invention to provide an improved input display apparatus utilizing touch key elements capable of directly and digitally changing set values or data by operating an increment key and a decrement key provided for orders of magnitude of
25 all set items on the transparent touch panel.

Another object of this invention is to provide a novel input display apparatus capable of directly

changing the set data with a digital switch system by
superposing an input setting key frame on the face plate
of a CRT so as to eliminate data or item not necessary to
be displayed so that displayed data can be viewed at a
5 glance.

Still another object of this invention is to provide
an improved input display apparatus utilizing touch switch
elements capable of directly changing the set values or
data with a digital switch system by using an input
10 setting key frame located at a position of a display
surface that is a face plate of a CRT not including set
items to be selected or the display members thereof.

According to this invention, these and further
objects can be accomplished by providing input display
15 apparatus comprising display means adapted to display a
plurality of set items; and a transparent touch panel
superposed on the display means and provided with a
plurality of touch key elements, each of the set items
comprising a plurality of digits representing a plurality
20 of orders of magnitude, at least one increment key and at
least one decrement key for changing the set items, the
increment key and the decrement key being used to change
the orders of magnitude.

In one embodiment discrete increment keys and
25 decrement keys are provided above and beneath a plurality
of juxtaposed input data display members. But in a
modified embodiment only one decrement key and only one

increment key are provided on one side of a plurality of juxtaposed input data display members for use in common for them. According to another embodiment a plurality of input setting key frames each including a plurality of juxtaposed input data display members and a plurality of increment keys and decrement keys which are disposed above and beneath the input data display members are arranged in a matrix for setting the injection pressure, the injection speed and the injection speed change position of an injection molding machine.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig. 1 is a block diagram showing a plan view of the input display apparatus embodying the invention;

Fig. 2 is a similar view showing a modified embodiment of this invention;

Figs. 3 and 4 are block diagrams showing plan views of prior art input display apparatus;

Figs. 5 and 6 are block diagrams of plan views showing other embodiments of this invention; and

Fig. 7 is a plan view showing touch key elements for all orders of magnitude of all set items constructed in accordance with this invention, wherein each of touch key elements is provided with an increment key and a decrement key.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of this invention will now be described with reference to Figs. 1 and 2 in which elements or data similar to or identical to those shown in Figs. 3 and 4 are designated by the same reference characters.

In Fig. 1, reference numeral 1 designates an input setting key frame in which are formed a plurality of input data display members 2 having a number of orders of magnitude corresponding to the maximum number of orders of the magnitude of a set data. On the upper and lower sides of the input data display members 2 are provided increment keys 3 and decrement keys 4 corresponding to respective orders of magnitude of the input data display member 2. These increment and decrement keys 3 and 4 and the set data member 15 have a touch key performance respectively.

A method of setting data will now be described. More particularly, when any one of the touch switch elements of a set data member 15 located immediately below the set item member 14 and representing an item to be set is operated, the display lamp, not shown, of a selected set data display member 15 is caused to flash so that the input setting key frame 1 would be displaced at a position not containing the set item member or its data display member to be selected on the face plate as shown in Figs. 1 and 2 resulting in an input enabling state. At this time, the input data display members 2 in the

input setting key frame 1 display the same data as the selected set data.

5 When either one of the increment key 3 and the decrement key 4 of any order of magnitude in the input setting key frame 1 is operated, the data can be set or changed by directly increasing or decreasing the set data.

10 In Figs. 1 and 2, the input setting key frame 1 is shown at different positions, so that when set items in the lower half of the face plate are selected, the input setting key frame 1 would be displayed at the upper position not containing the set item to be selected as shown in Fig. 1, whereas when the set items in the upper half are selected, the input setting key frame 1 would be displayed at the lower position not containing the set items to be selected as shown in Fig. 2. Thus, by displaying the input setting key frame 1 at either one of the upper and lower positions, the data of the original set item would not be erased. Should the original data be erased its original value would be lost.

20 Although in Figs. 1 - 4, a CRT was used as a display device, such other display devices as a plasma display device, an electroluminescent display device, and a liquid crystal display device which are arranged in a matrix or screen that can be covered with a transparent touch panel can also be used as the display device.

As above described, according to this invention since a transparent input setting key frame utilized to input data is superposed on a display device, that is the face plate of a CRT in the foregoing examples, the face plate can be used for displaying data thus improving the display performance.

Moreover, since the transparent input setting key frame 1 is provided with input data display members and increment and decrement keys corresponding to respective orders of magnitude of the input data display members, it becomes possible to readily change the set data with a digital switching system, thus not only improving the efficiency of data setting but also preventing erroneous setting.

Figs. 5 and 6 show other embodiments of this invention. Since the constructions of the transparent touch panels shown in Figs. 5 and 6 are similar to those shown in Figs. 1 and 2, and since only the construction and position of the input setting key 1 are different, only the different points will be described. The input setting key frame 1 contains input data display members 2 including an order of magnitude corresponding to the highest order of magnitude of the set data member 15, the order of magnitude selection keys 53 corresponding to all orders of magnitude of the input data display members 2 except the lowest order of magnitude and disposed above corresponding input data display members 2, an increment

key 54 and a decrement key 55 which are disposed on one side of the juxtaposed input data display members 2. The increment and decrement keys 54 and 55 are used to increase and decrease the data or value of a selected order of magnitude. The keys 53, 54 and 55 may take the form of touch keys. The embodiments shown in Figs. 5 and 6 are different from each other in that in Fig. 5, the input setting key frame 1 is provided at the right upper corner of the touch panel 50, whereas in Fig. 6 the input setting key frame 1 is provided at the right lower corner of the touch panel.

With the embodiments shown in Figs. 5 and 6 the value of set data can be directly increased or decreased by operating the increment key 54 or the decrement key 55. More particularly, a digit of tenth or higher order of magnitude can be changed by firstly operating one of the order of magnitude selection keys 53 and then operating the increment key 54 or the decrement key 55. Digits of the first order of magnitude can be changed by merely operating the increment key 54 or the decrement key 55 without operating the first order of magnitude selection key. The embodiments shown in Figs. 5 and 6 are convenient to change the data, especially of a large order of magnitude. For example, when it is desired to change presently displayed data 210 to 220, tenth order of magnitude selection key 53 is operated and then the increment key 54 is operated once. This operation is

much simpler and faster than a case wherein the orders of magnitude selection keys 53 are not used, in which case, the increment or decrement keys must be operated ten times.

5 Fig. 7 shows still another embodiment of this invention wherein a plurality of input setting key frames 1 shown in Fig. 1 are arranged in a matrix for incrementing or decrementing data displayed by input data display members 2 for different items. In the embodiment
10 shown in Fig. 7, items to be changed are the injection pressure, the injection speed and the injection speed changing position. As before, a transparent touch panel 50 is superposed on the surface of the face plate 51 of a CRT and provided with a plurality of touch key elements.
15 The uppermost row 55 bounded by dot and dash lines designates an injection pressure setter including three input setting key frames 1 each including five juxtaposed input data display members 2 representing digits of five orders of magnitude, five increment keys 3 and five
20 decrement keys 4 respectively disposed above and below the input data display members 2. The middle row 65 designates an injection speed setter, and the lowermost row 75 designates an injection speed change position setter. Setters 65 and 75 have the same construction.
25 In Fig. 7 settings of injection pressure, injection speed and injection speed change position of any order of magnitude can be readily changed by merely operating the

increment key 3 or decrement key 4 associated with the order.

As above described in connection with Fig. 4 where a ten key is located apart from the CRT the operativity is decreased, whereas when the ten key is included in a portion of the transparent touch panel, only the area of the face plate excluding the ten key can be used as the data display area. For this reason, when it is desired to display the ten key, an input setting key frame including the ten key, input data display members and a data input key may be provided at the position of the input setting key frame 1 as shown in Fig. 1.

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CLAIMS:

1. Input display apparatus comprising:

display means adapted to display a plurality of set items; and

a transparent touch panel superposed on said display means and provided with a plurality of touch key elements,

each of said set items comprising a plurality of digits representing a plurality of orders of magnitude,

at least one increment key and at least one decrement key for changing said set items,

said increment key and said decrement key being used to change said orders of magnitude.

2. The input display apparatus according to claim 1 wherein a plurality of set data display members are juxtaposed, said increment keys are disposed above said display members and said decrement keys are disposed beneath said display members.

3. The input display apparatus according to claim 1 wherein a plurality of input setting key frames each including a plurality of juxtaposed set data display members, and a plurality of increment and decrement keys respectively disposed above and below said set data display members, are arranged in a matrix on said transparent touch panel.

4. The input display apparatus according to claim 3 wherein said matrix is used to set an injection pressure, an injection speed and an injection speed change position of an injection compression molding machine.

5. The input display apparatus according to claim 1 further comprising an input setting key frame formed on said transparent touch panel, said input setting key frame containing a plurality of juxtaposed input data display members and said increment and decrement keys.

6. The input display apparatus according to claim 1 further comprising an input key frame formed on said transparent touch panel and containing a plurality of juxtaposed input data display members, a plurality of order of magnitude selection keys of a number corresponding to number of digits displayed by said input data display members except an input data display member corresponding to a lowest order of magnitude.